CLAIMS:

- 1. A method of manufacturing a cylinder head for a small engine comprising the steps of casting a cylinder head having an as-cast cylinder chamber defined by a cylinder wall, an ascast spark plug aperture communicating with one end of said cylinder chamber, cooling fins, an exhaust port extending from the cylinder chamber to a first face on an exhaust post flange, an intake port extending from said cylinder chamber to a second face on an intake port flange, fastener openings in said first and second faces, a foot flange having an as-cast mounting surface at another end of said cylinder chamber, and having as-cast fastening apertures in said foot flange; machining said cylinder wall to a predetermined tolerance; and tapping said spark plug aperture.
- 2. A method of manufacturing a cylinder head according to claim 1, wherein said as-cast spark-plug aperture is closed at one end by a thin web and wherein said thin web is removed prior to tapping said spark plug aperture.
- 3. A method of manufacturing a cylinder head according to claim 1, wherein said exhaust port aperture and said intake aperture are closed by thin webs forming portions of said as-cast cylinder chambers and wherein said thin webs are removed when said cylinder wall is machined.
- 4. A method of manufacturing a cylinder head according to claim 1, wherein the flatness of the as-cast mounting surface of said foot flange is 0.006 inch over its entire surface.
- 5. A method of manufacturing a cylinder head according to claim 1, wherein said as-cast fastening openings in said foot flange are cast to a perpendicularity of 0.002 inch with respect to the foot flange mounting surface.
- 6. A method of manufacturing a cylinder head according to claim 1, wherein said as-cast fastening openings in said foot flange are cast to within 0.006 inch of a true positional location on said foot flange.

7. A method of manufacturing a cylinder head for a small engine comprising the steps of casting a cylinder head having an as-cast cylinder chamber defined by a cylindrical wall, an as-cast spark plug aperture communicating with one end of said cylinder chamber, cooling fins, an exhaust port extending from the cylinder chamber to a first face on an exhaust port flange, an intake port extending from said cylinder chamber to a second face on an intake port flange, fastener openings in said first and second faces, a foot flange having an as-cast mounting surface at another end of said cylinder chamber, and having as-cast fastening in said foot flange, said as-cast fastening openings in said foot flange being cast within 0.006 inch of a true positional location on said foot flange and being cast to a perpendicularity of 0.002 inch with respect to the foot flange mounting surface, said as-cast mounting surface of said foot flange being 0.006 inch over its entire surface; boring said cylinder wall to a predetermined tolerance; and tapping said spark plug aperture.

- 8. A method of manufacturing a cylinder head according to claim 7, wherein said ascast spark-plug aperture is closed at one end by a thin web and wherein said thin web is removed prior to tapping said spark plug aperture.
- 9. A method of manufacturing a cylinder head according to claim 7, wherein said exhaust port aperture and said intake aperture are closed by thin webs forming portions of said as-cast cylinder chambers and wherein said thin webs are removed when said cylinder wall is machined.
- 10. A method of manufacturing a cylinder head according to claim 1, wherein apertures are cast in said fins, said apertures being axially aligned with the fastening apertures in said foot flange.
- 11. A method of manufacturing a cylinder head according to claim 1, wherein apertures are machined in said fins, said apertures being axially aligned with the fastening apertures in said foot flange.

1 12. A method of manufacturing a crankcase for a small engine comprising the steps of 2 casting a crankcase having a crank chamber, a crankcase connecting flange defining an opening 3 to said crank chamber, said crankcase connecting flange having an as-cast flange mounting 4 surface, and having first and second fastener openings cast into said as-cast flange mounting 5 surface, and threading said openings with self-threading fasteners.

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- 13. A method of manufacturing a crankcase according to claim 12, wherein the flatness of the as-cast flange mounting surface is 0.006 inch over its entire surface.
- 14. A method of manufacturing a crankcase according to claim 12, wherein said first and second fastener openings are cast into said surface to a perpendicularity of 0.002 inch with respect to said surface.
- 15. A method of manufacturing a crankcase according to claim 12, wherein first and second fastener openings are cast to within 0.006 inch of a true positional location on said surface.
- 16. A method of manufacturing a crankcase according to claim 12, wherein an O-ring groove is cast into said surface to surround said opening, and wherein an O-ring is inserted into said groove.
- 17. A method of manufacturing a crankcase for a small engine comprising the steps of casting a crankcase having a crankcase chamber, first and second bearing recess at an end of said crankcase chamber, each recess being defined by a cylindrical sidewall having a plurality of rounded radially inwardly directed flutes formed thereon, and pressing a roller bearing into each recess.
- 18. A method of manufacturing a crankcase according to claim 17, wherein the flutes are evenly spaced about the cylindrical sidewalls and are separated by arcuate sidewall portions.

19. A method of manufacturing a crankcase according to claim 18, wherein the flutes in said first bearing recess are offset an arcuate distance with respect to the flutes in said second bearing recess.

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- 20. A method of manufacturing a crankcase according to claim 19, wherein said arcuate distance corresponds to said arcuate dimension.
- 21. A method of manufacturing a crankcase according to claim 20, wherein the number of balls in said ball bearing do not equal the number of flutes in a bearing recess.
- 22. A method of manufacturing a crankcase according to claim 20, wherein the number of balls in said ball bearing are greater than the number of flutes in a bearing recess.
- 23. A method of manufacturing a crankcase according to claim 20, wherein there are eight balls in a ball bearing and seven flutes in a bearing recess.
- 24. A method of manufacturing a crankcase according to claim 17, wherein each roller bearing is pressed into each recess until it seats on said toroidal base.
- 25. A method of manufacturing and assembling a cylinder head and crankcase for a small engine comprising the steps of casting a cylinder head having an as-cast cylinder chamber defined by a cylinder wall, an as-cast spark plug aperture communicating with one end of said cylinder chamber, cooling fins, an exhaust port extending from the cylinder chamber to a first face on an exhaust port flange, an intake port extending from said cylinder chamber to a second face on an intake port flange, fastener openings in said first and second faces, a foot flange having an as-cast mounting surface at another end of said cylinder chamber, and having as-cast fastener apertures in said foot flange; machining said cylinder wall to a predetermined tolerance; tapping said spark plug aperture; casting a crankcase having a crankcase chamber, a crankcase connecting flange defining an opening to said crank chamber, said crankcase connecting flange having an as-cast flange mounting surface, and having first and second fastener openings cast into said as-cast flange mounting surface; positioning the as-cast mounting surface of said

cylinder head foot flange in face-to-face contact with the as-cast flange mounting surface of said crankcase so that the as-cast fastening apertures in the cylinder head foot flange are in axial alignment with the first and second fastener openings of said crankcase flange mounting surface; and fastening said cylinder head to said crankcase by threading said openings and apertures with self-threading fasteners.

- 26. A method of manufacturing a cylinder head according to claim 25, wherein said ascast spark-plug aperture is closed at one end by a thin web and wherein said thin web is removed prior to tapping said spark plug aperture.
- 27. A method of manufacturing a cylinder head according to claim 25, wherein said exhaust port aperture and said intake aperture are closed by thin webs forming portions of said as-cast cylinder chambers and wherein said thin webs are removed when said cylinder wall is machined.
- 28. A method of manufacturing a cylinder head according to claim 25, wherein the flatness of the as-cast mounting surface of said foot flange is 0.006 inch over its entire surface.
- 29. A method of manufacturing a cylinder head according to claim 25, wherein said ascast fastening openings in said foot flange are cast to a perpendicularity of 0.002 inch with respect to the foot flange mounting surface.
- 30. A method of manufacturing a cylinder head according to claim 25, wherein said ascast fastening openings in said foot flange are cast to within 0.006 inch of a true positional location on said foot flange.
- 31. A method of manufacturing a cylinder head according to claim 25, wherein apertures are cast in said fins, said apertures being axially aligned with the fastening apertures in said foot flange.

32. A method of manufacturing a cylinder head according to claim 25, wherein apertures are machined in said fins, said apertures being axially aligned with the fastening apertures in said foot flange.

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- 33. A method of manufacturing a crankcase according to claim 25, wherein the flatness of the as-cast flange mounting surface is 0.006 inch over its entire surface.
- 34. A method of manufacturing a crankcase according to claim 25, wherein said first and second fastener openings are cast into said surface to a perpendicularity of 0.002 inch with respect to said surface.
- 35. A method of manufacturing a crankcase according to claim 25, wherein first and second fastener openings are cast to within 0.006 inch of a true positional location on said surface.
- 36. A method of manufacturing a crankcase according to claim 25, wherein an O-ring groove is cast into said surface to surround said opening, and wherein an O-ring is inserted into said groove.